Mathematics QB For U2 - M2

1 Functions

1. Which sets of ordered pairs represent functions from A = {1, 2, 3, 4} to B = {-1, 0, 1, 2, 3}? Justify. (a) {(1,0), (3,3), (2,-1), (4,1), (2,2) } (b) {(1,2), (2,-1), (3,1), (4,3) } (c) {(1,3), (4,1), (2,2)} (d) {(1,1), (2,1), (3,1), (4,1)}
2. Find x, if $g(x) = 0$ where (a) $g(x) = \frac{5x-6}{7}$ (b) $g(x) = \frac{18-2x^2-6}{7}$
3. Find x, if $g^2(x) = 0$ where $g(x) = \frac{18-2x^2}{7}$
4. Express the following exponential equations in logarithmic form (a) $2^5 = 32$ (b) $9^{\frac{3}{2}} = 27$ (c) $3^{-4} = \frac{1}{81}$
5. Express the following logarithmic equations in exponential form (a) $\log_5\left(\frac{1}{25}\right) = -2$ (b) $\log_{\frac{1}{2}}(-8) = 3$
6. Write $5\log x + 7\log y - \log z$ as a single logarithm.
7. Solve for x (a) $\log 2 + \log(x+3) - \log(3x-5) = \log 3$ (b) $x + \log_{10}(1+2^x) = x\log_{10} 5 + \log_{10} 6$
8. If $\log\left(\frac{x+y}{3}\right) = \frac{1}{2}\log x + \frac{1}{2}\log y$, show that $\frac{x}{y} + \frac{y}{x} = 7$
9. If $\log\left(\frac{x-y}{4}\right) = \log\sqrt{x} + \log\sqrt{y}$, show that $(x+y)^2 = 20xy$
10. If $f(x) = 2x^2 + 3, g(x) = 5x - 2$,then find (a) f ∘ g (b) f ∘ f
11. Verify that f and g are inverse functions of each other, where (a) $f(x) = \frac{x-7}{4}, g(x) = 4x + 7$ (b) $f(x) = x^3 + 4, g(x) = \sqrt[3]{x-4}$
12. $f(x) = 2|x| + 3x$ then find (a) $f(2)$ (b) $f(-5)$

2 Limits

13. Evaluate : $\lim\limits_{x\to 2} \frac{x^{-3}-2^{-3}}{x-2}$
14. If $\lim\limits_{x\to 2} \frac{x^4-1}{x-1} = \lim\limits_{x\to 2} \frac{x^3-a^3}{x-a}$ find a.
15. Evaluate : $\lim\limits_{x\to 0} \frac{(1-x)^8-1}{(1-x)^2-1}$
16. Evaluate : $\lim\limits_{x\to 1} \frac{x+x^3+x^5+\cdots+x^{2n-1}-n}{x-1}$
17. Evaluate : $\lim\limits_{x\to 3} \frac{x+3}{x^2+4x+3}$
18. Evaluate : $\lim\limits_{x\to 3} \frac{x^2+2x-15}{x^2-5x+6}$
19. Evaluate : $\lim\limits_{x\to 2} \frac{x^3-7x+6}{x^3-7x^2+16x-12}$
20. Evaluate : $\lim\limits_{x\to 1} \left[\frac{x+2}{x^2-5x+4} + \frac{x-4}{3(x^2-3x+2)}\right]$
21. Evaluate : $\lim\limits_{x\to 3} \frac{\sqrt{2x+3}-\sqrt{4x-3}}{x^2-9}$
22. Evaluate : $\lim\limits_{x\to 2} \frac{x^2-4}{\sqrt{x+2}-\sqrt{3x-2}}$
23. Evaluate : $\lim\limits_{\theta\to 0} \frac{\sin m\theta}{\tan n\theta}$
24. Evaluate : $\lim\limits_{\theta\to 0} \frac{1-\cos 2\theta}{\theta^2}$
25. Evaluate : $\lim\limits_{x\to \frac{\pi}{3}} \frac{2-\operatorname{cosec} x}{\cot^2 x - 3}$
26. Evaluate : $\lim\limits_{x\to \pi} \frac{\sqrt{5+\cos x}-2}{(\pi-x)^2}$
27. Evaluate : $\lim\limits_{x\to 1} \frac{1-x^2}{\sin \pi x}$
28. Evaluate : $\lim\limits_{x\to 0} \frac{5^x-3^x-2^x-1}{x}$
29. Evaluate : $\lim\limits_{x\to 0} \frac{6^x+5^x+4^x-3^{x+1}}{x}$
30. Evaluate : $\lim\limits_{x\to 0} \left[\frac{3+x}{3-x}\right]^{\frac{1}{x}}$
31. Evaluate : $\lim\limits_{x\to 0} \frac{\log(3-x)-\log(3+x)}{x}$
32. Evaluate : $\lim\limits_{x\to 0} \frac{(2^x-1)^3}{(3^x-1)\cdot \sin x \cdot \log(1+x)}$
33. Evaluate : $\lim\limits_{x\to 0} \frac{(25)^x-2(5)^x+1}{x\sin x}$
34. Evaluate : $\lim\limits_{x\to \infty} \frac{x^3+3x+2}{(x+4)(x-6)(x-3)}$
35. Evaluate : $\lim\limits_{x\to \infty} \frac{a^3+bx^2+cx+d}{ex^3+fx^2+gx+h}$
36. Evaluate : $\lim\limits_{x\to \infty} \frac{x^3+3x+2}{(x+4)(x-6)(x-3)}$
37. Evaluate : $\lim\limits_{x\to \infty} \sqrt{x^2+4x+16} - \sqrt{x^2+16}$
38. Evaluate : $\lim\limits_{x\to \infty} \frac{(3x^2+4)(4x^2-6)(5x^2+2)}{4x^6+2x^4-1}$
39. Evaluate : $\lim\limits_{x\to \infty} \sqrt{x}\left(\sqrt{x+1} - \sqrt{x}\right)$